

REMARKS

Entry of the foregoing, reexamination and reconsideration of the application identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.112, and in light of the remarks which follow, are respectfully requested.

Claim 11 has been canceled and claims 1, 3 and 16 amended in response to issues raised in the Office Action. Claims 1-10 and 12-41 remain pending in this application with claims 19-39 being withdrawn from consideration.

Claim 11 was objected to for the reason set forth in paragraph (2) of the Office Action. In response thereto, claim 11 has been canceled.

Claims 1, 3, 10 and 16 have been rejected under 35 U.S.C. §112, second paragraph, as indefinite for reasons set forth in paragraphs (5), (6), (7), (8) and (9) of the Office Action. Reconsideration of this rejection is respectfully requested for the following reasons.

Claim 1 has been amended to remove the words "possibly" and "upper" and to clarify that at least one additional non-woven layer of synthetic fibers may optionally be present on the side of the non-woven glass fiber layer opposite that of the required non-woven layer of thermally shrunken synthetic fibers. Claim 3 has been amended to specify that there are at least two non-woven layers of thermally shrunken synthetic fibers present in the laminate. Claim 16 has been amended to clarify that additional reinforcement may be included.

With regard to the rejection of claim 10, applicants point out that thermal shrinking does not necessarily result in consolidation. Thus, thermal shrinking can be accomplished

without significant consolidation by heating the fibers in an oven (page 14, line 20) or using Infra-Red radiation (page 13, line 7). Alternatively, shrinking using heated rollers (i.e. calendering) would result in significant consolidation. Those of ordinary skill in this art would readily appreciate the effect of these thermal alternatives and understand the scope of claim 10. Based on the above, it is submitted that the §112 rejection of the claims should be withdrawn.

Claims 1-11, 14-16, 18, 40 and 41 have been rejected under 35 U.S.C. §103(a) as unpatentable over U.S. Patent 6,235,657 to Schops et al in view of U.S. Patent 5,171,629 to Heidel et al for reasons set forth in paragraph (11) of the Office Action.

Reconsideration of this rejection is respectfully requested for at least the following reasons.

Initially, applicants note that line 2 in paragraph (11) on page 4 of the Office Action incorrectly identified Heidel et al as U.S. Patent 4,578,307 which actually is a patent to Niki et al. Applicants assume that the rejection was intended to rely on U.S. Patent 5,171,629 to Heidel et al as the secondary reference and are proceeding on that assumption.

The presently claimed invention relates to a laminate of at least two layers and a method of manufacturing the laminate. The laminate includes at least one pre-consolidated non-woven layer containing glass staple fibers and at least one thermally shrunk non-woven layer of synthetic fibers, the layers being needled together wherein a portion of the synthetic fibers pass through the glass fiber layer and optionally through any synthetic fiber layer on the other side of the glass fiber layer. The needled laminate is binder free, i.e. has not been subjected to final consolidation with a binder.

The claimed features are all important in contributing to the unique properties of the laminate as discussed in the application. These properties include, among others, excellent mechanical strength including improved tear propagation, peel strength, and nail tear strength, a high resistance to delamination, improved dimensional stability and excellent flame retardation. The use of thermally shrunken synthetic fibers is a particularly important feature since this provides dimensional stability to the laminate such that subsequent heating of the laminate, e.g., during saturation with bitumen, does not result in significant shrinkage and dimensional instability. Using thermally shrunken synthetic fibers avoids or minimizes the "banana curving effect" associate with prior art laminates. These advantages of the laminates are achieved without the necessity of employing a consolidation binder, which entails additional expense.

Another feature recited in the claims which is important in attaining the benefits of the invention is the requirement that a portion of the fibers in the synthetic fiber layer pass through the glass fiber layer. This feature is significant in providing resistance to delamination. Thus, the feature provides improved bonding between the layers.

The laminate disclosed in Schops '657 differ from that in claim 1 in at least the following aspects: the glass fibers used in the reference are not pre-consolidated and the fibrous non-woven synthetic layer is not thermally shrunken. The statement is made on page 4 of the Office Action that the thermally shrunken feature in the claims is not given patentable weight because it is alleged to be a method limitation. It is submitted that this statement is in error. Thermal shrinkage is a physical phenomenon. Standard tests are available which measure changes in dimensions when a heat-shrinkable fabric is subjected

to heat-shrinking conditions. Note the discussion in U.S. Patent 4,578,307 to Nikki et al at column 4, lines 27-34 and column 5, lines 25-33. Thus, thermal shrinkage is related to structural features.

Heidel '629 does not supply the deficiencies of Schops '657. The '629 patent discloses a consolidated laminate having a pre-consolidated non-woven glass fiber mat needled to a non-woven layer of synthetic fibers. The non-woven layer of synthetic fibers is not heat-shrunk. Also, the laminates of Heidel '629 require a consolidation binder.

The Examiner argues on page 4 of the Office Action that Heidel '629 discloses the use of synthetic fibers having low shrinkage upon heating and this "meets the present limitation of thermally shrunken." Applicants respectfully disagree with this position. As those of ordinary skill are aware, fibrous webs having little or no shrinkage have completely different properties from heat-shrinkable webs. For example, fibrous laminates that are going to be shaped in heated molds frequently contain heat-shrinkable webs that shrink and conform to the shape of the molds upon heating. Non-shrinkage webs would not be useful for this purpose. Thus, the properties and characteristics of heat-shrinkable webs are completely different from non-shrinkable ones.

For a proper rejection under 35 U.S.C. §103(a), there must be some teaching or suggestion in the references themselves which would motivate those of ordinary skill to modify the structure of the primary reference in accordance with the teachings of the secondary reference to arrive at applicants' claimed invention. No such motivation exists. There is nothing in either reference to suggest modifying the laminates of Schops '657 in accordance with the disclosure of Heidel '629. Even if the disclosures were combined, the

resultant laminate, at the very least, would not have a thermally shrunken non-woven synthetic fiber layer.

In view of the above, the §103(a) rejection based on Schops '657 in view of Heidel '629 should be withdrawn.

Claims 1-11, 14-16, 18, 40 and 41 have been rejected under 35 U.S.C. §103(a) as unpatentable over Schops '657 in view of Heidel '629 and further in view of U.S. Patent No. 4,578,307 to Niki et al for reasons set forth in paragraph (12) of the Office Action. Reconsideration of this rejection is respectfully requested for at least the following reasons.

Niki '307 is relied upon to supply the deficiencies of the combined disclosures of Schops '657 and Heidel '629. According to the Office Action, Niki '307 discloses that polyethylene terephthalate filaments exhibit "good heat resistance, and good dimension stability" and further discloses that needled non-wovens of polyethylene terephthalate filaments which have been heat-shrunk are known in the art. From this, the Examiner concludes that one of ordinary skill would have been motivated to heat-shrink the non-woven synthetic fibers in the laminates of Schops '657.

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art" (MPEP §2143.01). The disclosure in column 1, lines 16-23 of Niki '307 indicates that polyethylene terephthalate (PET) filaments have good dimensional stability but low elongation at break point and thus, are unsuitable for post processing such as molding. The disclosure in

column 12, lines 50-58 of Niki '307 acknowledges that needle-punched heat-shrunk non-wovens are known but they have draw-backs in that they have "a hard handling because the filaments become hard" (column 12, lines 57-58).

Since Niki '307 indicates that dimensionally stable PET filaments have draw-backs and that known heat-shrunk non-wovens also have draw-backs, this would certainly discourage those of ordinary skill from using the heat-shrunk or dimensionally stable filaments described in Niki '307 in the laminates of Schops '657. Consequently, there would be no motivation to encourage the substitution suggested by the Examiner. In view of the above, the §103(a) rejection based on the combined disclosures of Schops '657, Heidel '629 and Niki '307 should be withdrawn.

Claims 12 and 13 have been rejected under 35 U.S.C. §103(a) as unpatentable over Heidel '629 in view of Schops '657 or alternatively, under 35 U.S.C. §103(a), as unpatentable over Schops '657 in view of Heidel '629 and further in view of Niki '307 for reasons set forth in paragraph (13) of the Office Action. Reconsideration of these rejections is respectfully requested for at least the following reasons.

Claims 12 and 13 are directly dependent upon claim 1 and thus, include all the features of the independent claim. Neither Heidel '629 nor Schops '657 discloses or suggests a laminate free of binder and having at least one thermally shrunken non-woven synthetic fiber layer. Accordingly, the §103(a) rejection based on Heidel '629 in view of Schops '657 should be withdrawn.

Regarding the alternative rejection based on Schops '657 in view of Heidel '629 and further in view of Niki '307, applicants refer to their previous arguments in support of

their position that this combination of art fails to render obvious under 35 U.S.C. §103(a) the presently claimed invention. The combined disclosure of these patents does not disclose or suggest a laminated article having all the features set forth in the present claims. Accordingly, the §103(a) rejection over Schops '657 in view of Heidel '629 and further in view of Niki '307 should be withdrawn.

Claim 17 stands rejected under 35 U.S.C. §103(a) as unpatentable over Heidel '629 in view of Schops '657 and further in view of U.S. Patent 4,892,780 to Cochran et al, or alternatively, under 35 U.S.C. §103(a) as unpatentable over Schops '657 in view of Heidel '629 and in view of Niki '307 and further in view of Cochran '780 for reasons expressed in paragraph (14) of the Office Action. Reconsideration of these rejections is respectfully requested for at least the following reasons.

Cochran '780 is relied upon in the aforementioned rejections for the disclosure of E-glass fibers in composites. According to the Office Action, those of ordinary skill would be motivated by the disclosure in Cochran '780 to use E-glass fibers in the laminates of Heidel '629 due to the "known strength and electrical properties of E-glass fibers".

Neither Heidel '629 nor Schops '657 discloses a laminate having all the features of the rejected claim including at least one layer of non-woven heat shrunk synthetic fibers. The combined disclosures of these two patents fails to disclose or suggest a key feature of the presently claimed invention. Cochran '780 does not disclose non-wovens containing heat-shrunk synthetic fibers. Also, applicants fail to see any disclosure in Cochran '780 regarding the strength and electrical properties of E-glass fibers or anything else which could motivate their use in Heidel '629. Accordingly, the combination of these three

patents fails to suggest the present invention and the §103(a) rejection based on Heidel, Schops and Cochran should be withdrawn.

The alternative rejection based on the combined disclosures of Schops, Heidel, Niki and Cochran likewise fails to disclose or suggest the laminates of the present invention. Cochran '780 does not appear to disclose any advantage to using E-glass fibers as opposed to any other glass fibers. In the absence of such, applicants respectfully submit that no motivation exists to use E-glass fibers in the glass fiber layers of Schops or Heidel. Further, there is nothing in the cited art which suggests needling a non-woven layer of heat-shrunk synthetic fibers to a pre-consolidated non-woven glass fiber layer and thereafter applying a consolidation binder. Based on these distinctions, the §103(a) rejection over Schops '657 in view of Heidel '629 and Niki '307 and further in view of Cochran '780 should be reconsidered and withdrawn.

To summarize the above, the laminates of the present invention include at least the following features: (1) a pre-consolidated non-woven mat containing glass staple fibers, (2) at least one non-woven layer of heat-shrunk synthetic fibers, these layers (3) being needled together such that a portion of the synthetic fibers passes through the non-woven web of glass fibers and (4) wherein the laminates are free of consolidation binder. To arrive at this invention from the disclosures of the references relied upon by the Examiner, one of ordinary skill in this art must decide to substitute a pre-consolidated glass fiber web for the non-consolidated web of Schops '657, substitute a heat-shrunk synthetic fiber web for the non-heat shrunk web of Schops '657, elect not to use a consolidation binder, etc. While Heidel '629 discloses a pre-consolidated glass fiber web, the reference requires a

consolidation binder. Thus, one must decide to eliminate the binder when adding the teachings of Heidel to that of Schops. To further modify the laminates of Schops/Heidel, one must ignore the discouraging statements of Niki '307 regarding the disadvantages of heat-shrunk non-woven synthetics and substitute this feature into the laminates of Schops/Heidel. Applicants respectfully submit that this constitutes an impermissible hindsight reconstruction of the prior art after having reviewed the present claims.

As further evidence of the unexpected advantages of the present invention, attention is directed to the data set forth in Example 3 on pages 19-20 of the disclosure. The absence of a consolidation binder unexpectedly provides improved strength and improved resistance to blistering and delamination. These results could not have been predicted from the cited references.

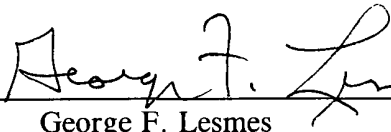
Applicants acknowledge receipt of initialed copies of a PTO-1449 form attached to the Information Disclosure Statement filed June 20, 2001, and a PTO-1449 form attached to the Information Disclosure Statement filed November 20, 2000. It is noted that some citations are crossed out but also appear to be initialed by the Examiner. All listed documents were cited by foreign patent offices in corresponding foreign applications and should be considered. Applicants respectfully request that the Examiner indicate that all documents cited on the PTO-1449 forms were considered.

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order, and such action is earnestly solicited. If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned at (703) 838-6683 at her earliest convenience.

Respectfully submitted,

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Attachment to AMENDMENT dated September 20, 2002

Marked-up Claims 1, 3 and 16

Please replace claims 1, 3 and 16 as follows:

1. (Amended) A laminate that is not subjected to final consolidation by a binder, comprising:

at least one non-woven mat containing glass staple fibers pre-consolidated with a resin, and at least one non-woven layer of synthetic fibers, wherein the at least one synthetic non-woven layer[s] and the pre-consolidated non-woven mat containing glass fibers are bounded together by needling such that a portion of the fibers of the [upper] synthetic non-woven layer passes through the non-woven layer containing glass fibers [possibly] and optionally through [the] any underlying synthetic non-woven layer, and wherein the synthetic fibers are heat shrunken and the laminate is binder free.

3. (Amended) The laminate according to Claim 1, wherein at least two non-woven layers of heat shrunken synthetic fibers are present and the gsm substance (basis weight) of said layers of synthetic non-woven layers is equal or different.

16. (Amended) The laminate according to Claim 1, wherein the laminate includes additional reinforcement[s].

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